

Amendments to the Claims

This listing of claims will replace all prior versions, and listings of claims in the application.

1-6. (cancelled)

7. (previously presented) A frequency up-converter, comprising:
 an acceptance module; and
 a harmonic generation and extraction module (HGEM) coupled to said acceptance module.

8. (previously presented) The frequency up-converter of claim 7, further comprising:
 a transmission module coupled to said HGEM.

9. (previously presented) The frequency up-converter of claim 7, wherein said acceptance module receives an information signal.

10. (previously presented) The frequency up-converter of claim 7, wherein said HGEM comprises:
 a switch, including:
 a first port that receives a bias signal;
 a second port that receives a control signal; and
 a third port.

11. (previously presented) The frequency up-converter of claim 10, wherein said HGEM further comprises:
 a filter, coupled to said switch.

12. (previously presented) The frequency up-converter of claim 10, wherein said filter is coupled to said first port of said switch.

13. (previously presented) The frequency up-converter of claim 10, wherein a harmonically rich signal is output from a port coupled to said first port of said switch.

14. (previously presented) The frequency up-converter of claim 10, wherein said third port is coupled to one of a reference and an information signal.

15. (previously presented) The frequency up-converter of claim 10, wherein said bias signal is a function of an information signal.

16. (previously presented) The frequency up-converter of claim 10, wherein said control signal is a function of an information signal.

17. (previously presented) The frequency up-converter of claim 10, wherein at least one of said control signal and said bias signal is a function of at least one information signal.

18. (previously presented) The frequency up-converter of claim 8, wherein said transmission module includes at least one of an amplifier and an antenna.

19. (previously presented) A frequency up-converter, comprising:
a switch, including:
a first port that receives a bias signal;
a second port that receives a control signal; and
a third port;
a filter, coupled to said switch.

20. (previously presented) The frequency up-converter of claim 19, further comprising:
an amplifier, coupled to an output of said filter.

21. (previously presented) The frequency up-converter of claim 19, further comprising:

an antenna, coupled to said filter.

22. (previously presented) The frequency up-converter of claim 19, wherein said filter is coupled to said first port of said switch.

23. (previously presented) The frequency up-converter of claim 19, wherein a harmonically rich signal is output from a port coupled to said first port of said switch.

24. (previously presented) The frequency up-converter of claim 23, wherein at least one harmonic in said harmonically rich signal is at a desired frequency.

25. (previously presented) The frequency up-converter of claim 24, wherein said filter isolates said at least one harmonic.

26. (previously presented) The frequency up-converter of claim 19, wherein said third port is coupled to one of a reference and an information signal.

27. (previously presented) The frequency up-converter of claim 19, wherein said bias signal is a function of an information signal.

28. (previously presented) The frequency up-converter of claim 19, wherein said control signal is a function of an information signal.

29. (previously presented) The frequency up-converter of claim 19, wherein at least one of said control signal and said bias signal is a function of at least one information signal.

30. (previously presented) A system, comprising:
a frequency up-converter, comprising:

a switch, including:
 a first port that receives a bias signal;
 a second port that receives a control signal; and
 a third port;
a filter, coupled to said switch.

31. (previously presented) The system of claim 30, wherein said frequency up-converter further comprises:

 an amplifier, coupled to an output of said filter.

32. (previously presented) The system of claim 30, wherein said frequency up-converter further comprises:

 an antenna, coupled to said filter.

33. (previously presented) The system of claim 30, wherein said filter is coupled to said first port of said switch.

34. (previously presented) The system of claim 30, wherein a harmonically rich signal is output from a port coupled to said first port of said switch.

35. (previously presented) The system of claim 34, wherein at least one harmonic in said harmonically rich signal is at a desired frequency.

36. (previously presented) The system of claim 35, wherein said filter isolates said at least one harmonic.

37. (previously presented) The system of claim 30, wherein said third port is coupled to one of a reference and an information signal.

38. (previously presented) The system of claim 30, wherein said bias signal is a function of an information signal.

39. (previously presented) The system of claim 30, wherein said control signal is a function of an information signal.

40. (previously presented) The system of claim 30, wherein at least one of said control signal and said bias signal is a function of at least one information signal.

41. (previously presented) A method of designing a transmitter, comprising:
selecting a frequency of a desired transmission signal;
determining at least one characteristic of an information signal;
determining a frequency of an oscillating signal, wherein said frequency of said oscillating signal is a subharmonic of said frequency of said desired transmission signal;
selecting a switch module;
selecting a filter module based on said frequency of said desired transmission signal; and
arranging said switch module and said filter module wherein, in operation, a control signal is received by said switch module to cause said switch module to gate and thereby generate a periodic signal having a plurality of harmonics, and said periodic signal is received by said filter module.

42. (previously presented) The method of claim 41, further comprising:
determining at least one pulse width of a string of pulses based on at least one characteristic of said desired transmission signal; and
designing a pulse shaping circuit based on said frequency of said oscillating signal and said at least one pulse width of said string of pulses to produce said control signal.

43. (previously presented) The method of claim 41, further comprising:
determining a frequency range for said desired transmission signal;
determining a frequency range for said oscillating signal, wherein a
frequency of said frequency range of said oscillating signal is a subharmonic of a
frequency of said frequency range of said desired transmission signal; and
wherein said step of selecting a filter module includes selecting said filter
module based on said frequency range of said desired transmission signal.

44. (previously presented) The method of claim 41, further comprising:
selecting an amplifier module; and
arranging said amplifier module to amplify the signal output by said filter
module.

45. (previously presented) The method of claim 41, further comprising:
selecting a transmission module; and
arranging said transmission module to transmit the signal output by said
filter module.

46. (previously presented) An apparatus for communicating, comprising:
a pulse shaping module to receive an oscillating signal and to output a
shaped string of pulses that is a function of said oscillating signal, wherein said pulse
shaping module transforms high values of said oscillating signal to pulses to produce
said shaped string of pulses;
a switch module to receive said shaped string of pulses and a bias signal,
wherein said shaped string of pulses causes said switch module to gate said bias signal
and thereby generate a periodic signal having a plurality of harmonics; and
at least one filter coupled to said switch module to isolate one or more
desired harmonics of said plurality of harmonics.

47. (previously presented) The apparatus of claim 46, wherein a high value of said oscillating signal is a value of said oscillating signal that is above a predetermined threshold value.

48. (previously presented) The apparatus of claim 46, wherein said pulse shaping module comprises:

an inverter, wherein the input of said inverter is coupled to the input of said pulse shaping module; and

an AND gate, wherein the first input of said AND gate is coupled to the input of said pulse shaping module, the second input of said AND gate is coupled to the output of said inverter, and the output of said AND gate is coupled to the output of said pulse shaping module.

49. (previously presented) The apparatus of claim 48, wherein the delay of said inverter from converting a signal from its input to its output is substantially the pulse width of said shaped string of pulses.

50. (previously presented) An apparatus for communicating, comprising:

a pulse shaping module to receive an oscillating signal and to output a shaped string of pulses that is a function of said oscillating signal, wherein said pulse shaping module transforms each consecutive high value and low value of said oscillating signal to two pulses to produce said shaped string of pulses;

a switch module to receive said shaped string of pulses and a bias signal, wherein said shaped string of pulses causes said switch module to gate said bias signal and thereby generate a periodic signal having a plurality of harmonics; and

at least one filter coupled to said switch module to isolate one or more desired harmonics of said plurality of harmonics.

51. (previously presented) The apparatus of claim 50, wherein a high value of said oscillating signal is a value of said oscillating signal that is above a first

predetermined threshold value and a low value of said oscillating signal is a value of said oscillating signal that is below a second predetermined threshold value.

52. (previously presented) The apparatus of claim 50, wherein said pulse shaping module comprises:

an inverter, wherein the input of said inverter is coupled to the input of said pulse shaping module; and

an XNOR gate, wherein the first input of said XNOR gate is coupled to the input of said pulse shaping module, the second input of said XNOR gate is coupled to the output of said inverter, and the output of said XNOR gate is coupled to the output of said pulse shaping module.

53. (previously presented) The apparatus of claim 52, wherein the delay of said inverter from converting the signal from its input to its output is substantially the pulse width of said shaped string of pulses.

54. (previously presented) An apparatus for communicating, comprising:

a pulse shaping module to receive an oscillating signal and to output a shaped string of pulses that is a function of said oscillating signal, wherein said pulse shaping module is comprised of a series of stages, wherein each stage shapes said oscillating signal until it is substantially a string of pulses to produce said shaped string of pulses;

a switch module to receive said shaped string of pulses and a bias signal, wherein said shaped string of pulses causes said switch module to gate said bias signal and thereby generate a periodic signal having a plurality of harmonics; and

at least one filter coupled to said switch module to isolate one or more desired harmonics of said plurality of harmonics.

55. (previously presented) The apparatus of claim 54, wherein said series of stages comprises:

a first inverter, wherein the input of said first inverter is coupled to the input of said first pulse shaping module;

a second inverter, wherein the output of said first inverter is coupled to the input of said second inverter;

a third inverter, wherein the output of said second inverter is coupled to the input of said third inverter;

a capacitor, wherein the first node of said capacitor is coupled to the output of said third inverter;

a resistor, wherein the first node of said resistor is coupled to the second node of said capacitor, wherein the second node of said resistor is coupled to a reference signal; and

a fourth inverter, wherein the second node of said capacitor is coupled to the input of said fourth inverter, wherein the first node of said resistor is coupled to the input of said fourth inverter, and the output of said fourth inverter is coupled to the output of said pulse shaping module.

56. (previously presented) An apparatus for communicating, comprising:

at least one first switch module that receives at least a first oscillating signal and a first bias signal, wherein said first oscillating signal causes said at least one first switch module to gate said first bias signal and thereby generate a first periodic signal having a first plurality of harmonics;

at least one second switch module that receives at least a second oscillating signal and a second bias signal, wherein said second oscillating signal causes said at least one second switch module to gate said second bias signal and thereby generate a second periodic signal having a second plurality of harmonics;

wherein said first periodic signal and said second periodic signal are combined to thereby generate a combined periodic signal having a combined plurality of harmonics; and

at least one filter that receives said combined periodic signal, wherein said at least one filter isolates at least one harmonic of said combined plurality of harmonics.

57. (previously presented) An apparatus for communicating, comprising:

at least one first switch module that receives at least a first oscillating signal and a first bias signal, wherein said first oscillating signal causes said at least one first switch module to gate said first bias signal and thereby generate a first periodic signal having a first plurality of harmonics;

at least one second switch module that receives at least a second oscillating signal and a second bias signal, wherein said second oscillating signal causes said at least one second switch module to gate said second bias signal and thereby generate a second periodic signal having a second plurality of harmonics;

wherein said first periodic signal and said second periodic signal are combined to thereby generate a combined periodic signal having a combined plurality of harmonics; and

at least one filter that receives said combined periodic signal and removes any unwanted harmonics from said combined periodic signal to produce a filtered periodic signal having a third plurality of harmonics.

58. (previously presented) A transmitter, comprising:

a first switch that gates a first reference signal according to a first control signal to generate a first harmonically rich signal; and

a second switch that gates a second reference signal according to a second control signal to generate a second harmonically rich signal;

wherein said first and second control signals are generated such that at any time only one of said first and second switches is closed; and

wherein said first and second harmonically rich signals are combined to form a combined harmonically rich signal.

59. (previously presented) The transmitter of claim 58, further comprising:
at least one filter to isolate at least one harmonic contained in said
combined harmonically rich signal.

60. (previously presented) A method of transmitting, comprising:
gating a first reference signal according to a first control signal to
generate a first harmonically rich signal; and
gating a second reference signal according to a second control signal to
generate a second harmonically rich signal;
wherein said first and second control signals are generated such that at
any time only one of said first and second reference signals is being gated; and
wherein said first and second harmonically rich signals are combined to
form a combined harmonically rich signal.

61. (previously presented) The method of claim 60, further comprising:
filtering from said combined harmonically rich signal any undesired
harmonics.

62. (new) A method for transmitting an information signal, comprising:
modulating an oscillating signal with an information signal;
shaping the modulated oscillating signal into a modulated rectangular wave
signal having a string of rectangular pulses, the modulated rectangular wave signal
including modulated harmonics of a frequency of the oscillating signal, wherein said
shaping includes the step of forming the rectangular pulses to have a pulse width selected
to enhance a desired modulated harmonic of the modulated harmonics;
amplifying the modulated rectangular wave signal to generate an amplified
modulated rectangular wave signal having a string of amplified rectangular pulses that
include amplified versions of the modulated harmonics, including an amplified version
of the desired modulated harmonic; and
filtering the amplified modulated rectangular wave signal to generate a filtered
modulated signal that includes the amplified desired modulated harmonic.

63. (new) The method of claim 62, further comprising:
transmitting the filtered modulated signal.

64. (new) The method of claim 63, wherein said modulating step comprises:
frequency modulating the oscillating signal with the information signal.

65. (new) The method of claim 64, wherein said frequency modulating step
comprises:
frequency shift keying (FSK) modulating the oscillating signal with the
information signal.

66. (new) The method of claim 62, wherein said modulating step comprises:
phase modulating the oscillating signal with the information signal.

67. (new) The method of claim 66, wherein said phase modulating step
comprises:
phase shift keying (PSK) modulating the oscillating signal with the information
signal.

68. (new) The method of claim 62, wherein the information signal has a
bandwidth, wherein said filtering step comprises:
band pass filtering the amplified modulated rectangular wave signal with a
bandpass filter having a pass band width at least as wide as the information signal
bandwidth.

69. (new) The method of claim 62, wherein the pulse forming step
comprises:
forming the pulses of the modulated rectangular wave signal to have a pulse
width selected to cause the desired harmonic to have a desired amplitude.

70. (new) The method of claim 62, wherein the amplifying step comprises:
gating a bias signal according to the modulated rectangular wave signal to
generate the amplified modulated rectangular wave signal.

71. (new) The method of claim 70, wherein said gating step comprises:
applying the modulated rectangular wave signal to the gate terminal of a
transistor; and
applying the bias signal to a drain terminal of the transistor;
wherein the amplified modulated rectangular wave signal is generated at the
source terminal of the transistor.

72. (new) The method of claim 62, wherein said shaping step comprises:
applying the modulated oscillating signal to at least one logic gate;
wherein the modulated rectangular wave signal is output by the at least one
digital logic device.

73. (new) The method of claim 72, wherein said at least one digital logic
device includes a plurality of digital logic devices coupled in series.

74. (new) The method of claim 62, wherein said filtering step comprises:
substantially attenuating the amplified modulated harmonics other than the
amplified desired modulated harmonic.

75. (new) A method for transmitting an information signal, comprising:
shaping a modulated oscillating signal into a modulated rectangular wave signal
having a string of rectangular pulses, the rectangular wave signal including modulated
harmonics of the oscillating signal, said shaping including the step of forming the
rectangular pulses to have a pulse width selected to enhance an amplitude of a desired
modulated harmonic of the modulated harmonics;

amplifying the modulated rectangular wave signal to generate an amplified modulated rectangular wave signal that includes an amplified version of the desired modulated harmonic; and

filtering the amplified modulated rectangular wave signal to remove amplified modulated harmonics other than the amplified desired modulated harmonic.

76. (new) A method for transmitting an information signal, comprising:
shaping a modulated oscillating signal into a modulated rectangular wave signal having a string of rectangular pulses that have pulse widths selected to enhance an amplitude of a desired modulated harmonic of the modulated oscillating signal comprised by the rectangular wave signal;

amplifying the modulated rectangular wave signal to generate an amplified modulated rectangular wave signal that includes an amplified version of the desired modulated harmonic; and

filtering the amplified modulated rectangular wave signal to remove amplified modulated harmonics other than the amplified desired modulated harmonic.

77. (new) A method for transmitting an information signal, comprising:
shaping an oscillating signal into a rectangular wave signal having rectangular pulses that repeat at a frequency of the oscillating signal, the rectangular wave signal formed of a plurality of harmonics of the frequency, including the step of forming the pulses to have a pulse width selected to enhance a desired harmonic of the harmonics;

gating an information signal according to the rectangular wave signal to generate a modulated rectangular wave signal, wherein the modulated rectangular wave signal comprises modulated harmonics including a desired modulated frequency corresponding to a frequency of the desired harmonic; and

filtering the modulated rectangular wave signal to generate a filtered modulated signal that includes the desired modulated frequency.

78. (new) The method of claim 77, further comprising:
transmitting the filtered modulated signal.

79. (new) The method of claim 77, wherein said gating step comprises:
amplitude modulating the rectangular wave signal with the information signal.

80. (new) The method of claim 79, wherein said amplitude modulating
comprises:
amplitude shift keying (ASK) modulating the rectangular wave signal with the
information signal.

81. (new) The method of claim 77, wherein the information signal has a
bandwidth, wherein said filtering step comprises:
band pass filtering the modulated rectangular wave signal with a bandpass filter
having a pass band width at least as wide as the information signal bandwidth.

82. (new) The method of claim 77, wherein the pulse forming step
comprises:
forming the pulses to have a pulse width selected to cause the desired harmonic
to have a desired amplitude.

83. (new) The method of claim 77, further comprising:
amplifying the modulated rectangular wave signal.

84. (new) The method of claim 77, wherein said gating step comprises:
applying the rectangular wave signal to the gate terminal of a transistor; and
applying the information signal to a drain terminal of the transistor;
wherein the modulated rectangular wave signal is generated at the source
terminal of the transistor.

85. (new) The method of claim 84, wherein the pulse forming step
comprises:

forming the pulses to have a pulse width selected to cause the desired harmonic to have an amplitude sufficient to cause the desired modulated frequency to have a desired amplitude in the generated modulated rectangular wave signal.

86. (new) The method of claim 77, wherein said shaping step comprises: applying the oscillating signal to at least one digital logic device; wherein the rectangular wave signal is output by the at least one digital logic device.

87. (new) The method of claim 86, wherein said at least one digital logic device includes a plurality of digital logic devices coupled in series.

88. (new) The method of claim 77, wherein said filtering step comprises: substantially attenuating the modulated harmonics other than the desired modulated frequency.

89. (new) A method for transmitting an information signal, comprising: shaping an oscillating signal into a rectangular wave signal having rectangular pulses that repeat at a frequency of the oscillating signal, wherein the rectangular wave signal comprises harmonics of the oscillating signal, said shaping including the step of forming the pulses to have a pulse width selected to enhance an amplitude of a desired one of the harmonics;

modulating the rectangular wave signal with an information signal to generate a modulated rectangular wave signal, wherein the modulated rectangular wave signal comprises a modulated version of the desired harmonic; and

filtering the modulated rectangular wave signal to remove modulated harmonics other than the modulated version of the desired harmonic.

90. (new) A method for transmitting an information signal, comprising:

shaping an oscillating signal into a rectangular wave signal having rectangular pulses that have pulse widths selected to enhance an amplitude of a desired harmonic of the oscillating signal comprised by the rectangular wave signal;

modulating the rectangular wave signal with an information signal to generate a modulated rectangular wave signal, wherein the modulated rectangular wave signal comprises a modulated version of the desired harmonic; and

filtering the modulated rectangular wave signal to remove modulated harmonics other than the modulated version of the desired harmonic.